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Original Research Article

A clinical, radiological and etiological study of neonatal pneumonia

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ABSTRACT

Background: Pneumonia contributes to between 7, 50,000 and 1.2 million neonatal deaths and an unknown number of stillbirths each year worldwide1. It is estimated that 3.9 million of the 10.8 million deaths in children annually worldwide occur in the first 28 days of life.2 Neonatal pneumonia can be preventable if it is diagnosed as early as possible. Early recognition and prompt management are essential for the better outcome.
Aim and objective: To determine bacterial etiology of neonatal pneumonia and to study the risk factors associated with neonatal pneumonia.
Methods: A prospective, descriptive study was conducted for the duration of one year from July 2014 to June 2015 in Pragna children's Hospital, a tertiary care centre, Hyderabad, Telangana, India. A total of 100 neonates were admitted in Pragna children's Hospital with the signs and symptoms of neonatal pneumonia. A detailed history was taken including age, obstetric history of the mother, detailed birth history including resuscitation details and gestational age assessment were evaluated.
Results: Out of 100 cases, 39(39%) neonates were preterm babies and 61(61%) were term. Also found history of Prolonged Rupture of Membrane (PROM) in 22% cases, maternal fever in 18%, home deliveries in 14% and foul smelling liquor in 18%. Out of 100 cases, 51 (51%) cases had positive finding in Chest X-Ray for neonatal pneumonia and 57(57%) had pneumonia with septicemia. Out of 100 cases, 9% of cases are positive for Coagulase negative *staphylococcus* (CONS), 5% for *Klebsiella pneumonia*, 2% for *Pseudomonas aeroginosa* and the remaining 84% of the cases had no growth for any organism.
Conclusions: Major predisposing factors included PROM, foul smelling liquor, maternal fever, and home deliveries. CONS was the commonest organism isolated in blood culture.

Keywords: Neonatal pneumonia, PROM, maternal fever, home deliveries, coagulase negative *staphylococcus, klebsiella, pseudomonas*

INTRODUCTION

Pneumonia contributes to between 7, 50,000 and 1.2 million neonatal deaths and an unknown number of stillbirths each year worldwide.[1] It is estimated that 3.9 million of the 10.8 million deaths in children annually worldwide occur in the first 28 days of life.[2] More than 96% of all neonatal deaths occur in developing countries, and pneumonia accounts for a substantial proportion of these.

Neonatal pneumonia can be preventable if it is diagnosed as early as possible. Early recognition and prompt management are essential for the better outcome. Health

care provider should be familiar with the signs, symptoms and risk factors of pneumonia.

Studies have been conducted to know the risk factors for neonatal pneumonia in all over the world. Because of paucity of previous studies in this region about this topic and to know signs and symptoms, causative organisms, risk factors of neonatal pneumonia, this study has been taken up.

Aims and objectives

1. To determine bacterial etiology of neonatal pneumonia.
2. To study risk factors associated with neonatal pneumonia.

METHODS

This was a prospective, descriptive study conducted in Pragna children's Hospital, tertiary care centre, Hyderabad, Telangana, India.

A total of 100 neonates were admitted in Pragna children's Hospital with the signs and symptoms of neonatal pneumonia. Study was conducted for the period of July 2014 to May 2015. A detailed history was taken including age, obstetric history of the mother, detailed birth history including resuscitation details and gestational age assessment were evaluated. Those cases are included whose parents/guardian give consent for the study.

Case definition

A neonate with respiratory distress (any of; rapid, noisy, or difficult breathing; respiratory rate >60/min; chest retractions; cough; grunting) who has: (a) a positive blood culture or (b) any two or more of the following:

1. Predisposing factors

- Maternal fever
- Foul smelling liquor
- Prolonged rupture of membranes (>24 hours)

2. Clinical picture of sepsis

- Poor feeding
- Lethargy
- Poor reflexes
- Hypothermia or hyperthermia
- Abdominal distension

3. Radiograph suggestive of pneumonia (nodular or coarse patchy infiltrate, diffuse haziness or granularity, air bronchogram, lobar or segmental consolidation); radiological changes not resolved within 48 hours.

4. Positive sepsis screen (any of the following)

- Leucocyte count out of reference range (<5000/mm3).
- Absolute neutrophil count less than 1800/mm3
- If Immature to total neutrophil ratio more than 0.2
- If micro ESR more than 15mm at 1st hour.
- Raised C reactive protein for more than 1mg/dl.

This definition of neonatal pneumonia is based on guidelines recommended by National Neonatology Forum (National Neonatal-Perinatal Database 2002-03).[3]

Inclusion criteria

All newborns admitted in our hospital with the signs and symptoms of neonatal pneumonia from birth to 28 days of age satisfying the above mentioned criteria and whose parents have given a written consent for the study.

Exclusion criteria

1. Meconium Aspiration Syndrome
2. Hyaline membrane disease
3. Transient tachypnea of the newborn
4. Hypoxic ischaemic encephalopathy
5. Pulmonary Haemorrhage
6. Pneumothorax
7. Congenital heart disease.
8. Airway abnormalities (ex: tracheoesophageal fistula, cleft palate, laryngomalacia)
9. Congenital malformation.
10. Neonates of parents who are not willing to participate in the study.

A detailed history was taken including age, parity, obstetric history of the mother with emphasis on exact time of rupture of membranes, duration history and antibiotics before labour were evaluated. Detailed birth history including resuscitation details, Apgar score and gestational age assessment were evaluated.

In examination of the neonate the pulse, respiratory rate, capillary filling time (CFT) and temperature were noted followed by systemic examination. Required investigations are done for the neonate and followed during their hospital stay.

CRP latex agglutination test

C-reactive protein (CRP), an acute phase reactant, is synthesized in the liver in response to inflammatory cytokines and may rise more than 1000 times during an acute phase response. It falls quickly after efficient elimination of microbial stimulus, due to its short half-life of 19 hours.[4]

In human serum when the latex suspension is mixed with serum containing elevated CRP levels on a slide clear agglutination is seen within 2 minutes.[5,6] A positive result is indicated by the obvious agglutination of the latex, in a

clear solution. A negative result is indicated by no change in the latex suspension on the test slide. Positive result will be obtained at a serum CRP concentration above 6mg/litre and negative result will be obtained at 6mg/litre and below.

X-ray findings in pneumonia

X-ray picture suggestive of pneumonia characterized by any of the following: nodular or coarse patchy infiltrates, diffuse haziness or granularity, air bronchogram, lobar or segmental consolidation.[7]

The radiographic signs of neonatal pneumonia are quite non-specific and blend in with other diseases of the term and preterm neonate.

Blood culture

Blood was drawn before starting any antimicrobial agent with aseptic precaution from a peripheral vein. The volume of blood drawn was 2ml and transferred to a glucose broth in a dilution of 1:10 [8]. This was then sent to department of Microbiology for culture and sensitivity. The bacteria were identified by the morphological, biochemical and serological reactions.

Statistical analysis

The collected data was entered into Microsoft Excel sheet and the descriptive statistical analysis was done. Categorical data will be expressed as frequencies and percentages.

RESULTS

Out of 100 cases, 39 (39%) neonates were preterm babies and 61 (61%) were term babies. Out of 100 cases, 51 (51%) cases had positive finding in Chest X-Ray for neonatal pneumonia and 49(49%) cases had no positive finding in Chest X-Ray for neonatal pneumonia but were fulfilling the criteria as mentioned in the case definition for neonatal pneumonia.

Table 1: Distribution of risk factors associated with neonatal pneumonia.

Risk Factors	No. of cases (out of 100)	Percentage %
Maternal fever	18	18%
Prolonged Rupture of Membrane (PROM) >24 hours	22	22%
Home delivery	14	14%
Foul smelling liquor	18	18%

Out of 100 cases, 57(57 %) had pneumonia with septicemia, 43 (43) had pneumonia without septicemia as shown in Table 3.

Table 2: Distribution of cases with positive chest X ray and blood culture.

Investigation	No. of cases (out of 100)	Percentage %
Chest X ray positive	51	51%
Blood Culture	16	16%

Table 3: Distribution of cases according to septicemia.

	Number of cases	Percentage
Pneumonia with septicemia	57	57
Pneumonia without septicemia	43	43
Total	100	100

Here septicemia denotes either baby should be septic screen positive as mentioned in case definition or blood culture positive or both.

DISCUSSION

The present study is a prospective, descriptive study conducted to evaluate the causative organisms of neonatal pneumonia in this region in order to evaluate the preventive measures for neonatal pneumonia.

A study conducted by Haney et al, found that PROM in 93% cases, maternal fever 30%, Foul smelling liquor 20%.[9] Present study found that PROM seen in 22% cases, maternal fever in 18%, and foul smelling liquor in 18% as shown in table 1. These results are consistent with observation made by Mathur et al, PROM 33%, maternal fever 20%, and foul smelling liquor 13%.[10]

In the present study, 51% of the cases had positive signs for pneumonia in chest X-ray as shown in table 2, this finding in the present was slightly higher when compare to a study conducted by Mathur et al, in which radiological findings were reported only in 44.5% of cases.[10]

In the present study, septicemia was positive in 57 neonates with pneumonia as shown in table 3. This result in the study is similar to a study conducted by Mathur et al, study where septicemia was positive in 58 neonates with pneumonia.[10]

In the presently study, bacterial etiology of pneumonia was established in 16 neonates (16%) by blood culture as shown in Table 2. This was very lower than that reported in Mathur et al, study (47.5%).[10] Whereas this finding in the present study is nearly in consistent with other study result, which was reported by English et al, in 2003 (8.5%).[11]

In the present study, out of 100 cases, 9% of cases are positive for Coagulase negative staphylococcus, 5% of

the cases are positive for *Klebsiella pneumonia*, 2% of the cases are positive for *Pseudomonas aeruginosa* and the remaining 84% of the cases had no growth for any organism as shown in Figure 1.

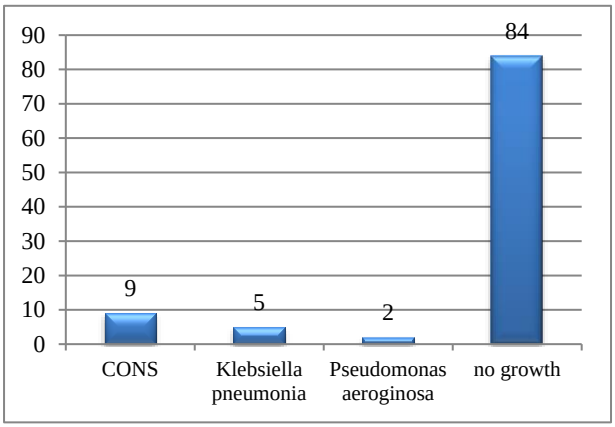

Figure 1: Distribution of Cases According to the Organisms Isolated in Blood Culture.

In the present study, most of the cases had predisposing risk factors like maternal fever, prolonged rupture of membrane, home delivery of the baby, preterm, low birth weight baby and foul smelling liquor.

In many places, neonates are not taken outside the home, even if they are sick, so referral to a hospital is impossible. Often there is a preference for traditional village remedies. In addition, because the signs of severe illness can be very subtle in neonates, parents may not recognize that their infant is sick until it is too late, and geographical and financial constraints make referral to hospital very difficult for much of the world's population

Improving supportive care and the safety and accessibility of hospitals for seriously ill newborn babies is a high priority globally. A comprehensive approach to prevent and treat neonatal pneumonia would therefore involve interventions at community level, in primary health facilities, and in district and tertiary hospitals.

CONCLUSION

- Major predisposing factors included, prolonged rupture of membranes, foul smelling liquor, maternal fever, premature, low birth weight baby, home deliveries.
- Out of 100 cases, 51 (51%) cases had positive finding in Chest X-Ray for neonatal pneumonia.
- Coagulase negative staphylococcus was the commonest organism isolated in blood culture followed by *Klebsiella pneumonia* and *Pseudomonas aeruginosa*.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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